HK 84: Accelerators and Instrumentation I

Time: Friday 11:00–12:45 Location: H-ZO 80

HK 84.1 Fr 11:00 H-ZO 80

Diamonds as fast timing detectors for MIPS: The HADES proton-beam monitor/start detector — •Wolfgang Koenig and Jerzy Pietraszko for the HADES-Collaboration — GSI, Darmstadt, Germany

Position sensitive mono-crystalline diamond detectors were used successfully as start/beam-monitoring detectors for proton beams (1.2 GeV - 3.5 GeV) at rates of up to $3{\cdot}10^6$/s/10mm^2. Two different detector sizes of 3.5×3.5 mm^2 (4 segments) and 4.7×4.7 mm^2 (8 segments) were used with thicknesses of 300 μm and 500 μm, respectively. Utilizing dedicated fast amplifiers directly attached to the diamond segments, a time resolution of about 100ps could be achieved with a signal base width of about 8-10 ns and $\geq$95% detection efficiency. The signal/RMS-noise ratio amounted to 22 (300 μm) and 26 (500 μm) at rise times of 1.2 ns and 1.3 ns, respectively. The measured time resolution is about a factor of two worse than expected from the signal/noise ratio. A significant variation of rise times was observed which most likely results from rather inhomogeneous intrinsic fields (upcharging effects due to charge trapping). Furthermore, at high rates unreasonably large leakage currents appeared for some detectors which eventually resulted in sudden discharges, tripping the detector bias. These effects seem to depend strongly on the metallization procedure. An optimization of this procedure is currently investigated.

HK 84.2 Fr 11:15 H-ZO 80

Performace studies of the new Multiwire Drift Chambers for HADES using the new Readout system — •Jörn Wüstenfeld[1], Kathrin Göbel[3], Burkhardt Kämpfer[1], Roland Kotte[1], Lothar Naumann[1], Marek Palka[2,4], Attilio Tarantola[2,3], and Michael Traxler[2] — [1]Institut für Strahlenphysik, Forschungszentrum Dresden - Rossendorf, Dresden, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [3]Institut für Kernphysik, Goethe Universität, Frankfurt, Germany — [4]Smoluchowski Institute of Physics, Jagiellonian University, Krakow, Poland

Seven new Multiwire Drift Chambers of plane 1 for the High-Acceptance Di-Elektron Spectrometer (HADES) are assembled in the Detector Workshop of the Forschungszentrum Dresden-Rossendorf. We present the results of test performed on the first chamber in comparison with the main design parameters .
End of 2008 one detector was completely equipped with the new generation of the readout system designed for the high multiplicity environment as provided in collisions of heavy systems at HADES @ FAIR. The chamber was investigated with cosmic rays and β (^{90}Sr) source. The obtained results show that the new design fulfills the requirements with respect to efficiency, accuracy and rate capability. These chambers will be installed in 2009 to be armed for the upcoming heavy ion program.

HK 84.3 Fr 11:30 H-ZO 80

Optimierung von Multigap Resistive Plate Chamber (MRPC) für CBM — •Ingo M. Deppner für die FOPI-Kollaboration — Physikalisches Institut, Universität Heidelberg

Im FOPI-Experiment wurde 2007 ein großflächiges MRPC-Detektorsystem erfolgreich in Betrieb genommen und dabei das Zeitauflösungsvermögen soweit verbessert, dass Kaonen mit einem Impuls bis zu 1 GeV/c über eine Flugstrecke von 1,5 m identifiziert werden können.

Die Daten, die im April 2008 während einer Meßstrahlzeit gewonnen wurden, werden im Hinblick auf die Leistungscharakteristik des MRPCs ausgewertet und präsentiert. Das beobachtete Verhalten fließt unter anderem in die Entwicklung von Prototyp-Zähler für das CBM-Experiment ein. Das CBM-Experiment soll einen Flugzeitdetektor mit 80 ps Systemauflösung und einer Fläche von 100 m^2 bekommen. Die Elektrodengeometrie erhält im Bezug auf Cross-Talk, Clustergrösse und nicht zuletzt auf die begrenzte Anzahl von 60000 Kanälen große Bedeutung. Erste Untersuchungen von speziellen CBM-Prototypen sind im Gange und werden hier diskutiert.

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HK 84.4 Fr 11:45 H-ZO 80

Development of radiation hard silicon sensors for the CBM Silicon Tracking System using Simulation approach — •Sudeep Chatterji for the CBM-Collaboration — GSI, Darmstadt

The very intense radiation environment of the planned Compressed Baryonic Matter (CBM) experiment at the international research center FAIR makes radiation hardness the most important issue for the Silicon Tracking System (STS). STS will consist of eight stations of double sided strip detectors at a distance between 25 cm to 100 cm downstream of the target. It is expected that the total integrated fluence will reach 1×10^{15} cm^{-2} 1 MeV neutrons equivalent which is more than expected at LHC at CERN. The major macroscopic effect of radiation damage in determining the viability of long-term operation of silicon sensors is the change in the effective charge carrier concentration (N_{eff}), leading to type inversion. For the safe operation over full CBM life time, detectors are required to sustain very high voltage operation, well exceeding the bias voltage needed to fully deplete the heavily irradiated sensors. Thus, the main effort in the development of silicon sensors is concentrated on a design that avoids p-n junction breakdown at operational biases.

Simulations are carried out to study the effect of change in N_{eff}, as well as crucial geometrical parameters, on the breakdown performance using the PISCES code. Process simulation has also been performed using SUPREM-4 for studying the annealing behaviour of implanted dopant.

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HK 84.5 Fr 12:00 H-ZO 80

The ALICE muon spectrometer — •martino gagliardi — Università di Torino, Italy — INFN Torino, Italy — CERN, Genève, Switzerland

The ALICE experiment at the Large Hadron Collider was designed to study the properties of nuclear matter at extreme energy density, with particular regard to the transition to the Quark Gluon Plasma (QGP) phase.

The ALICE muon spectrometer will analyse the production of beauty and charmed mesons in heavy ion collisions at $\sqrt{s}$= 5.5 TeV per nucleon pair, through their muonic decays. In particular, the expected quarkonia suppression by QGP will be assessed. Data will also be taken in p-p collisions at 14 TeV, which will provide both a reference for the analysis and an insight on the quarkonia production mechanism.

The muon spectrometer was designed to achieve a mass resolution as good as 100 MeV/c^2 at the Υ mass. It consists of a set of absorbers, 5 tracking stations and a trigger system, all of which are now installed in the ALICE cavern. Intense commissioning is ongoing, including data-taking with cosmic rays.

A detailed description of the muon spectrometer will be presented, together with the results from the commissioning phase and the expected performance for a few physics topics.

HK 84.6 Fr 12:15 H-ZO 80

Commissioning of the PHOS detector at ALICE/LHC — •Øystein Djuvsland for the ALICE-PHOS-Collaboration — Department of Physics and Technolgy, University of Bergen, Norway

The Photon Spectrometer (PHOS) is an homogeneous electromagnetic calorimeter designed to detect and measure the energy of neutral particles produced in hadron (p-p and Pb-Pb) collisions at the LHC accelerator. To distinguish photons from the different processes and measure the spectra an excellent energy resolution and high statistics are required. An extensive commissioning process to calibrate and tune the performance of the detector has been undertaken to fulfil these requirements. The first PHOS module was installed ready for data taking for the start up of LHC in the fall of 2008, and for the restart a total of 3 modules will be installed and commissioned. Calibration and equalisation of the gains of the Avalanche Photo Diodes (APDs) used for detection of scintillating light is especially important to acquire the desired energy resolution. One of the possible methods to achieve this before first collisions is to take advantage of the known energy deposits of muons produced in cosmic events.

Experiences and results from the commissioning of the first PHOS module will be presented.

HK 84.7 Fr 12:30 H-ZO 80

Particle Identification with the ALICE TPC — •Alexander Kalweit — Institut für Kernphysik TU Darmstadt, Schlossgartenstr. 9, 64289 Darmstadt

We present a study of the particle identification capabilities of the ALICE Time Projection Chamber (TPC). The particle identification (PID) plays an important role for the overall performance of the experiment. Charged particles traversing the TPC gas lose a certain amount of energy per unit path length depending on their momentum and rest mass. By this, pions, kaons, protons, deuterons, electrons and muons can be identified over a broad momentum range after a precise gain calibration with radioactive Krypton gas. Results from Monte-Carlo studies with PYTHIA-generated events and from the cosmic runs in 2008 show that the PID works according to specifications and that the mean energy loss per unit path length can be described with a parameterization of the Bethe-Bloch curve.